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(54) Reeling device and method in reeling of a paper web or equivalent

(57) The invention concerns a reeling device, comprising a reel drum (31) supported on reeling rails (13) or equivalent, around which reel drum the paper web or equivalent is reeled into a reel (12) or equivalent through a reeling nip between the reeling device and the reel (12). The reeling device in the reeling machine consists of at least one set of belt rolls (20) that extends in the cross direction substantially across the web width. The invention also concerns a method in reeling and unwinding of a paper web or equivalent, in which method the paper web or equivalent is reeled around a reel drum (31) supported on reeling rails (13) or equivalent into a reel (12) or unwound from the reel by means of a reeling nip (N). In the method, the paper web or equivalent is reeled through a reeling nip (N) formed between at least one set of belt rolls (20) extending in the cross direction substantially across the web width and the reel (12... 12D) that is being formed/unwound.

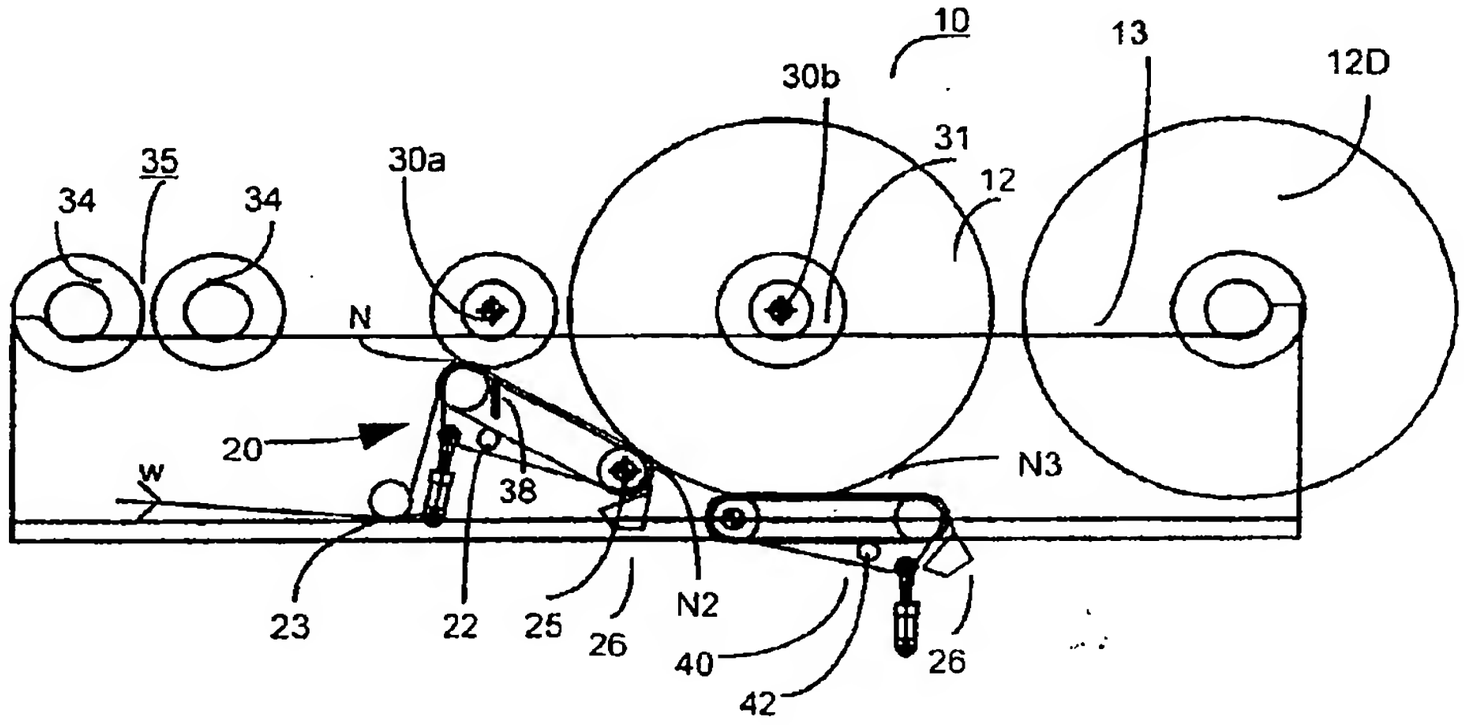

FIG. 2

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Description

The invention concerns a reeling device in accordance with the preamble of claim 1.

The invention also concerns a method in accordance with the preamble of claim 13 in reeling of a paper web or equivalent.

A traditional reel-up is based on loading of a reel drum and of a paper reel formed onto said reel drum against a reeling cylinder, and the construction of a prior-art reel-up is often complicated, and the reeling result achieved by means of said reel-up is also often inadequate. In a reel-up, one of the factors for selecting the control has been the web tension that affects the quality of reeling, and in some prior-art solutions centre drive of the reel drum has also been employed in order to compensate for the linear load and for loads disadvantageous for the structure of the reel, which loads have mainly arisen from the mass of the reel increasing along with the progress of reeling. It has been noticed that the linear load effective in the reeling nip formed by the reeling cylinder and the reel that is being formed is the most efficient reeling parameter in consideration of the reel hardnesses that are achieved. In the prior-art solutions, the control of the reeling nip and of the linear load has been limited primarily to regulation of the level of loading alone.

With the present-day technology, the control of unwinding that is achieved by means of unwind stands is partly inadequate, which is emphasized further with increasing reel diameters. Particularly high requirements are imposed by slowing down and acceleration of the reel, in which case, besides the structure of the reel, these situations must be well under control.

The present-day unwind stands are typically based on utilization of a centre drive coupled with the reel drum. At the beginning of unwinding, the reel is accelerated by means of the centre drive, and at the running speed the drive performs a slight braking in order to maintain and to regulate the web tension. Problems of regulation are caused by the large mass of the roll and by possible non-roundness. The reel is supported on the reeling rails from the bearing housings of the reel drum only, which causes a disadvantageous loading in particular of the bottom layers of the reel, which arises from bending of the reel drum and from the mass of the reel and which increases the risk of formation of bottom broke.

An increased diameter of the paper reel that is formed by means of the reel-up increases the efficiency of the reel-up and of the whole line of paper manufacture, provided that the loads that are produced by the increased reel mass and that are unfavourable for the structure of the reel can be controlled and kept at a sufficiently low level. Likewise in unwinding, the running of the process can be affected in a positive way if the control of the nip load can be influenced in an efficient way. Controlling of these loads is one of the most important objectives of the present invention.

One future challenge in reeling will be achieving of a good reeling result with increasing running speeds. Along with increasing running speeds, in particular the problems of air in the reeling up, i.e. mainly the problems arising from entering into the reel of the air that travels along with the web that is being reeled, are increasing constantly, and thus, it is an object of the invention to suggest an arrangement in which also these problems have been eliminated or at least minimized.

It is a further object of the invention to provide a reeling device whose construction is simple, whereby a smaller amount of raw-material for the manufacture and a simpler system of control as well as a shorter installation time are achieved.

It is a further object of the invention to suggest solutions for future challenges of both unwinding and reeling up so that, in the reeling device in accordance with the present invention, the structure of the reel can be controlled more precisely than in the prior art.

In view of achieving the objectives stated above and those that will come out later, the reeling device in accordance with the invention is mainly characterized in what is stated in the characterizing part of claim 1.

On the other hand, the method in accordance with the invention in reeling of a paper web or equivalent is characterized in what is stated in the characterizing part of claim 13.

In accordance with the invention, when a reeling cylinder is substituted for by a set of belt rolls, on one hand, the controllability of the reeling nip is improved. When belt support of the paper reel that is being formed is employed, which support is achieved by means of a set of belt rolls, the nip pressures in the reeling nip remain considerably lower than with traditional reel-ups, because the nip is considerably longer and a belt as a material is softer than a reeling cylinder made of cast iron, in which case the loading profile of the nip effect is more even. In the arrangement in accordance with the invention, it is also possible to regulate the nip pressure by varying the belt tension while the loading remains at the same level. In a reel-up of a wide machine, in which the set of belt rolls is preferably composed of several separately adjustable parts, it is possible to utilize profiling of the nip load in the cross direction when the parts of the set of rolls are arranged so that they can be loaded independently.

Preferably, in accordance with the invention, the belts that are used in the set of belt rolls are such that a sufficient/suitable friction between the belt and the web can be achieved. The belts can be both permeable or impermeable to air. In the set of belts, it is also possible to use both belt sorts as appropriately distributed.

According to the invention, the reel drum is supported on rails and/or on a set of belt rolls so that the desired nip force is produced. In each mode, the distribution of loading can vary within the range 0...100 %.

In an arrangement in accordance with the invention,

in stead of one set of belt rolls, there may also be two sets of belt rolls placed one after the other, in which case functions of their own can be assigned to the different sets of rolls, such as, for example, binding the surface, initial acceleration, slowing down of a complete machine reel. By means of two sets of belt rolls placed one after the other, two simultaneous reeling nips are also provided.

According to a preferred embodiment of the invention, the belt support in accordance with the invention is utilized in unwinding of a reel. The belt support may operate independently or together with centre drive. In an unwinding in accordance with the invention, a support of the reel across the entire width and an extended nip of good hold qualities provided by the set of belts are achieved. By means of a resilient set of belts and by means of a suitable coverage of the set of belts, the outlet angle of the web unwound from the reel can be made invariable, and thereby it is possible to attenuate variations of web tension arising, e.g., from non-roundness of the reel.

The set of belts is preferably mounted so that, as viewed in the machine direction, its first end is stationary and the second end is displaceable in relation to the first end. Preferably a hydraulic cylinder or an equivalent actuator is used for regulation of the height of the second end. The loading of the set of belts can be controlled, for example, by means of a feedback of force or in compliance with measurement of the location of the set of belts by means of position regulation. Thus, the solutions suggested within the scope of the inventive idea of the present patent application can be applied both to unwinding and to reeling up even though the solutions are described mainly as applied to reeling up.

According to a preferred embodiment of the invention, the reeling device comprises measurement and/or control and/or storage members, which record and/or store information concerning the reeling process. Said information can be, among other things, information on the belt tension / on control of same, on a relief force / on control of same, on the mass of the reel and/or on non-roundness of the reel, on the position of the reeling carriages. In particular the belt tension and the relief force are to be understood as a separate information/control related to a single unit of a set of belt rolls, a number of such units being possibly fitted in the cross direction of the web. The measurement data can also be some other reeling parameter. The measurement data can be used for controlling the reeling process during reeling, but the measurement data can also be transmitted further to other stages of the process as a control parameter. The data can also be stored specifically for each reel, in which case, for example, in unwinding it is possible to utilize the individual reel-up data of each machine reel, for example, in connection with its unwinding. In this way, favourably, in unwinding it is possible to take into account the cross-direction profile of the reel as a function of the reel diameter in unwinding, for example, by loading and/or relieving the reel by means of the set of belts so that the loading and/or the relief profile corresponds to that used in reeling up.

In accordance with the invention, in reeling, it is also possible to use a suitable combination of centre drive and circumferential drive provided by means of belts.

In a reel-up in accordance with the invention, a single set of belt rolls consists of one or several belts, in which case the operation of the reel-up does not necessarily depend on a single belt. The set of rolls is mounted preferably at the rear end, i.e. at the end next to the dry end, on the frame of the reel-up, and at the forward end there is a hydraulic cylinder or an equivalent actuator, by whose means the set of rolls can, among other things, be raised and lowered for passing a reel drum. By means of the actuator, it is also possible to regulate the position of the set of belt rolls in the vertical direction and the loading/relieving in compliance with the stage of reeling.

Substitution for a reeling cylinder by a set of belt rolls in accordance with the invention also permits bringing of the stock of reel drums to the level of the reeling rails, which lowers the number of parts in the reel-up, increases the rigidity of the reel-up, and simplifies the sequence of operation of the reel-up and makes said sequence quicker. At the same time, the risks related to falling down in connection with lowering of reel drums are eliminated. The construction of the reel-up in accordance with the invention readily also permits connecting of the reel-up to the end of a paper or coating machine or some other finishing machine based on a supported web draw. If necessary, in connection with a set of belt rolls in accordance with the invention, it is possible to provide an air doctor or equivalent to keep the belts clean and to prevent winding of the web around the set of belt rolls.

In the following, the invention will be described in more detail with reference to the exemplifying figures in the accompanying drawing, the invention being, however, not supposed to be strictly confined to the details of said illustrations.

Figures 1A...1D are schematic illustrations of a reel-up in accordance with the invention viewed in the longitudinal direction of the web in different stages of reeling,

Figure 2 is a schematic illustration of a second reel-up in accordance with the invention viewed in the longitudinal direction of the web,

Figure 3 is a schematic illustration of a reel-up in accordance with the invention viewed from above,

Figure 4 is a schematic illustration of a mode in accordance with the invention for carrying out a reeling process in accordance with the invention,

Figure 5 is a schematic illustration of the change process in a reeling device in accordance with the invention, and

Figure 6 is a schematic illustration of one mode in accordance with the invention for carrying out an unwind process in accordance with the invention.

In the way illustrated in Figs. 1A...1D, in the reel-up 10 the paper web or equivalent is reeled into a paper reel 12 by means of the set of belt rolls 20 through the reeling nip N formed between the reel 12 that is formed and the set of belt rolls 20 onto the reel drum 31. In the stock 35 of reel drums in the reel-up 10, there are reel drums 34 in the waiting position. In the reeling stage, the reel drum 31 is provided with centre drive 30a,30b. The reel drum 31 of the paper reel 12 is supported in the cross direction on reeling rails 13 or equivalent by means of reeling carriages 36,37 or equivalent.

In the situation shown in Fig. 1A, the reel-up 10 is in a stand-by stage. The reel drum 31 has been shifted to the reeling position, but the set of belt rolls 20 has not yet been raised to form the reeling nip N with the reel drum 31. The primary reeling sledge 36 has been fitted to support the reel drum 31, and the secondary reeling sledge 37 is still empty. The reel drum placed on the primary reeling sledge 36 can be coupled with the primary centre drive 30a, and the reel drum placed on the secondary reeling drum 37 can be coupled with the secondary centre drive 30b.

In the stage shown in Fig. 1B, the paper web or equivalent can be passed through the reeling nip N formed between the set of belt rolls 20 and the reel drum 31 to be reeled around the reel drum 31 into a paper reel.

In the stage shown in Fig. 1C, the reeling of the paper web W or equivalent has been started and made progress, and the reel drum 31 has moved forwards on the reeling rails 13 or equivalent, and the reeling nip N is formed between the set of belt rolls 20 and the paper reel 12 that is being formed, and the intensity of the nip load has been regulated by placing the set of belt rolls in the desired position in relation to the reel 12. At this stage, the drives are also changed, in which connection the primary centre drive 30a is replaced by the secondary centre drive 30b. At this stage the support of the reel is also shifted from the primary reeling sledge 36 to the secondary reeling sledge 37. In Fig. 1C a stage is shown in which both sledges are in connection with the reel drum 31. After this the primary centre drive 30a and the primary reeling sledge 36 become free for fetching the next reel drum 31',34.

In the situation shown in Fig. 1D, the following reel drum 31' with its centre drive 30a has been brought to the vicinity of the set of belt rolls 20 to the reeling position, and between the drum 31' and the set of belt rolls 20 there is the reeling nip N. The paper reel 12 that is being completed is also in reeling nip contact N_2 with the set of belt rolls 20. As is shown in Fig. 1D, the construction of the set of belt rolls 20 permits the change, during which both the paper reel 12 that is being completed and the new reel drum 31' are both in nip contact with the set of belt rolls 20, and the web is fully supported. In this situation, the reel 12 that is being completed is preferably in engagement with the secondary centre drive 30b and the new reel drum 31' in engagement with the primary centre drive 30a. In connection with the invention, if necessary or if desired, it is also possible to use a band change device or other solutions.

The set of belt rolls 20 in accordance with the invention is provided with a tension regulation member 22, by whose means the nip pressure effective during reeling is regulated by regulating the tension of the belts 24. The set of belt rolls 20 is provided with a hydraulic cylinder 23 or with an equivalent actuator, by whose means the position of the set of belt rolls 20 in the direction of height can be regulated. The actuator 23 is connected to one end of the set of belt rolls 20, and the opposite end of the set of belt rolls is linked by means of an articulated joint 25 with the frame constructions or foundations of the reel-up 10. Moreover, in connection with the set of belt rolls, an air doctor 26 or equivalent is fitted, which keeps the belts 24 of the set of belt rolls clean and prevents winding of the web around the set of belt rolls 20.

In connection with the reel-up 10 shown in Fig. 2, as viewed in the running direction of the web, in addition to the set of belt rolls 20, a second set of belt rolls 40 has been fitted. In this exemplifying embodiment, functions of its own can be assigned to each of the sets of belt rolls 20,40, for example, in relation to binding the surface of the web, initial acceleration, slowing down the complete machine reel, etc. In addition to this, if necessary, two reeling nips N_2 and N_3 are produced at the same time for the same paper reel 12. In Fig. 2, the reel-up 10 is illustrated in a reeling situation substantially corresponding to Fig. 1D. The set of belt rolls 40 has been attached to the frame constructions or foundations of the reel-up 10, and it may comprise one or several belts in the cross direction of the web. For regulation of the tension of the belts, there is a tension regulation member 42. In respect of its basic construction, the set of belt rolls 40 can, if necessary, also be different from the set of rolls 20, for example provided with no actuator 23. The set of belt rolls 40 can also be provided with a drive. In the solution of Fig. 2, a blow device 38 is also shown, which will be described in more detail in relation to Fig. 5. This set of belts can also be provided with a doctor or equivalent.

As is shown in Fig. 3, the set of belt rolls 20 is preferably composed of a number of modules 21 in the cross direction, in which case, either between the modules 21 or in place of a single belt 24 or at or below such a belt, it is possible to install a stationary lower blow pipe 38, by whose means the reel change and threading are carried out, preferably as of full width. If necessary, there may also be several pipes in the cross direction of the web. The medium that is blown is air, water or an adhesive or solid matter. An advantage of water is the effect of binding the surface sheets on a complete paper reel, in which case a rider device is not necessarily needed.

Thus, in Fig. 5 a favourable change process in accordance with the invention is illustrated. The change can be carried out in a way in itself known, but preferably so that, by means of a blow pipe or equivalent 38 placed

in connection with the set of belt rolls (herein just one pipe is shown, but there may also be several pipes in the cross direction), the web is cut off and/or a cut-off web is guided to around the new reel drum 31' and further into the nip N. The reel 12 that is being completed has been transferred into a position which permits the introduction of the new reel drum 31' into nip connection with the set of belt rolls 20. The new reel drum 31' has been accelerated to the web speed before it is brought into contact with the web. The change process is carried out preferably so that, at least substantially directly after the change, the initial reeling is carried out preferably against the roll R of the set of belts for a certain period of time. In the change process itself, the blowing is carried out preferably so that the end W' of the cut-off web substantially maintains its speed and is guided in the direction of the face of the reel drum 31'. The change can also be carried out when the reel drum 31' forms a nip with the set of belts only, in which case the change blowing can be directed even more closely into the nip between the reel 31' and the set of belts substantially almost in the direction of the tangent of the roll. The blow pipe communicates with a source of blow medium through suitable ducts.

As comes out from Fig. 3, each of the modules 21 in the set of belt rolls 20 comprises a number of belts 24, whose tension can be regulated either individually or jointly by means of the belt tension regulator 22. By means of the belt 24 tension, it is possible to affect the nip pressure effective in the reeling. The belts used in the set of belt rolls 20 can be permeable 24' to air or impermeable 24. Even though, in Fig. 3, belts impermeable to air have been shown in the middle area of the set of belts, this is by no means supposed to confine the locations of the belts permeable and impermeable to air to that illustrated in the figure, but the illustration is just understood as an example. Under these circumstances, the properties of the belts in the set of belts and the positions of said belts in the cross direction are chosen in the way in compliance with the requirements imposed in each particular case.

In reeling up in accordance with an embodiment of the invention, in the initial situation of the running sequence of the belt support reel-up 10, the primary reeling sledge 36 is placed at the front (in the wet end), and the secondary reeling sledge 37 is placed at the rear (in the dry end). In the threading stage, a reel drum 34 is brought to the stock 35 and the holders are lowered and the reel drum 34 is passed to the stop position in the stock 35. The locking jaws of the primary reeling sledge 36 are closed, and the coupling of the primary-reel centre drive 30a is closed. The set of belt rolls 20 is lowered, and the primary reeling carriage 36 is passed to the reel-start position, Fig. 1A. After this, the set of belt rolls 20 is raised, arrow S in Fig. 1B, by means of the hydraulic cylinder/cylinders 23 or an equivalent actuator(s), and a joint starting of the drives 30a and 25 is carried out (can also be started separately before the set of belt rolls 20 is raised). After threading of the lead-in strip, the web is widened to full width. If desired, a change blowing is blown, and initial reeling is carried out. The rear jaw of the secondary reeling sledge 37 is opened and the complete reel is delivered, after which the centre drive 30b is switched to running when the diameter of the reel is suitable. The secondary reeling sledge 37 is switched to loading, and the front jaw of the reeling sledge is raised (change of linear load). The coupling of the secondary centre drive 30b is closed (change of torque), and the coupling of the primary-reel centre drive 30a and the locking jaws of the primary-reel carriage are opened, and the primary-reel carriage 36 is shifted to the front to fetch an empty reel drum. Favourably, the primary centre drive 30a is fitted at the tending side of the reeling device 10, and the secondary centre drive 30b at the driving side.

In constant running, first a reel drum 34 is brought to the stock 35 if there is no drum as yet, and the holders are lowered, and the reel drum 34 is passed to the stop position in the stock 35.

In a reeling process, the reel drum 31 of the reel 12 that is being completed is in connection with the secondary reeling sledge 37, and the secondary centre drive 30b is in engagement, and the primary reeling sledge 36 is free to receive a new reel drum 31'. When the reel that is being completed is ready for being changed, the locking jaws of the primary reeling carriage 36 and the coupling of the primary-reel centre drive 30a are closed early enough, and the primary-reel centre drive 30a is switched to running. The set of belt rolls 20 is lowered by means of the actuator 23, and the primary-reel carriage is shifted to the reel start position. In this connection, the reel that is being completed is preferably all the time in nip contact with the set of belts. The set of belt rolls 20 is raised by means of the actuator 23, when the speeds are synchronized, the nip is closed and the change blowing is blown. After the change, the full reel is stopped, for example, with the aid of the centre drive under control while, for example, the set of belts 40 shown in Fig. 2 supports the reel. Now the secondary reeling sledge 37 can be shifted to the new reel that is being completed. The rear jaw of the secondary reeling sledge is raised, and the centre drive 30b is switched to running, and the secondary reeling sledge is switched to loading. The front jaw of the secondary reeling sledge is raised (change of linear load), and the coupling of the centre drive 30b is closed (change of torque). The coupling of the primary-reel centre drive 30a is opened, the locking jaws of the primary reeling carriage are opened, the primary reeling carriage is run to the front, etc.

Fig. 4 shows a preferred embodiment of the invention, in which the reeling device in accordance with the invention comprises measurement and/or control and/or storage members 44, which record and/or store information on the reeling process. The information can be, among other things, information on the belt tension / on control of same A, on the relief force / control of

same B, on the reel mass C, on the position of the reeling carriage D. Information can also be collected concerning other reeling parameters. In particular the belt tension A and the relief force B should be understood as separate data/control for a single unit of set of belt rolls, a number of such units being possibly provided in the cross direction of the web. The measurement data can be used for controlling the reeling process during the reeling, but the measurement data can also be transmitted further to other stages of the process as a control parameter. The data can also be stored specifically for each reel, in which case, for example, in unwinding it is possible to make use of the measurement data. In unwinding, the cross-direction profile of the reel as a function of the reel diameter can be taken into account, for example, by loading and/or relieving the roll so that the loading/relief profile corresponds to that used in the reeling up.

Fig. 6 is a schematic illustration of a mode in accordance with the invention for carrying out the unwind process in accordance with the invention. It comprises elements corresponding to those in a reel-up. In the unwind stand 10b the paper web W or equivalent is unwound from a machine reel 12f by means of, and supported by, a set of belt rolls 20 through an unwind nip N formed between the reel 12f and the set of belt rolls 20 to be fed further into a process of treatment of the paper or equivalent, such as calendering or coating (not shown). In the machine reel storage space 35 of the unwind stand 10b, there are machine reels 12e in the waiting position. In the unwind stage, if necessary, the reel drum 31" of the machine reel is provided with a centre drive 30c. The reel drum 31" of the paper reel 12f is supported in the cross direction on reeling rails 13 or equivalent by means of reeling carriages (not shown) or equivalent.

In unwinding, the properties of the invention can be utilized substantially similarly to the reeling up described above.

Above, the invention has been described with reference to some preferred exemplifying embodiments of same only, the invention being, yet, not supposed to be strictly confined to the details of said embodiments. Many variations and modifications are possible within the scope of the inventive idea defined in the following claims.

Claims

1. A reel-up, comprising a reel drum (31) supported on reeling rails (13) or equivalent, around which reel drum the paper web or equivalent is reeled into a reel (12) or equivalent through a reeling nip between the reeling device and the reel (12), **characterized** in that the reeling device in the reel-up consists of at least one set of belt rolls (20) that extends in the cross direction substantially across the web width.

2. A reel-up as claimed in claim 1, **characterized** in that, in the reeling stage, the reel drum (31) is provided with centre drive (30).

3. A reel-up as claimed in claim 1 or 2, **characterized** in that the reeling device is composed of two sets of belt rolls (20,40) placed one after the other in the running direction of the web.

4. A reel-up as claimed in any of the claims 1 to 3, **characterized** in that the set of belt rolls (20,40) comprises at least one rotatable belt (24).

5. A reel-up as claimed in any of the claims 1 to 3, **characterized** in that the set of belt rolls (20,40) comprises a number of belts (24) placed side by side.

6. A reel-up as claimed in any of the claims 1 to 5, **characterized** in that the belts (24) are permeable to air.

7. A reel-up as claimed in any of the claims 1 to 5, **characterized** in that the belts (24) are impermeable to air.

8. A reel-up as claimed in any of the claims 1 to 7, **characterized** in that the set of belt rolls (20,40) comprises an actuator (23), by whose means one end of the set of belt rolls (20) has been fitted to be raised and lowered substantially in relation to the web.

9. A reel-up as claimed in any of the claims 1 to 8, **characterized** in that one end of the set of belt rolls (20,40) is linked by means of an articulated joint (25) with the frame constructions or foundations of the reel-up (10).

10. A reel-up as claimed in any of the claims 1 to 9, **characterized** in that the set of belt rolls (20,40) comprises a tension regulation member (22,42) in view of regulation of the tension of the belts (21).

11. A reel-up as claimed in any of the claims 1 to 10, **characterized** in that the set of belt rolls (20,40) is composed of a number of modules (21), each of which comprises a number of belts (24), the tension of said belts (24) being adjustable either individually or jointly.

12. A reel-up as claimed in any of the claims 1 to 11, **characterized** in that a reel drum stock (35) is fitted on the same reeling rails (13) or equivalent as are the reel drums (31) that are being reeled.

13. A method in reeling of a paper web or equivalent, in which method the paper web or equivalent is reeled around a reel drum (31) supported on reeling rails (13) or equivalent into a reel (12) or unwound from a reel drum by means of a reeling nip (N), **characterized** in that, in the method, the paper web or equivalent is reeled through a reeling nip (N) formed between at least one set of belt rolls (20) extending in the cross direction substantially across the web width and the reel (12...12D) that is being formed.

14. A method as claimed in claim 13, **characterized** in that, in the method, in the reeling stage the reel drum (31) is rotated by means of centre drive (30).

15. A method as claimed in claim 13 or 14, **characterized** in that, in the method, a second reeling nip (N_3) is formed for the reel (12) that is being formed/unwound by means of a second set of belt rolls (40).

16. A method as claimed in any of the claims 13 to 15, **characterized** in that, in the method, the position of the set of belt rolls (20,40) which forms the reeling nip (N) is regulated by means of an actuator (25), by whose means one end of the set of belt rolls (20,40) is raised and/or lowered substantially in relation to the web.

17. A method as claimed in any of the claims 13 to 16, **characterized** in that, in the method, the tension of the belts (24) in the set of belt rolls (20,40) is regulated by means of a tension regulation member (22,42) so as to regulate the nip load.

18. A method as claimed in any of the claims 13 to 17, **characterized** in that, in the method, in the cross direction of the web, the nip load is profiled by regulating the load of the belts (24) or of the modules (24) composed of belts separately or jointly.

19. A method as claimed in any of the claims 13 to 17, **characterized** in that, in the method, information concerning the reeling process is recorded and/or stored, which information is used further in unwinding preferably so that the cross-direction profile of the reel as a function of the reel diameter can be taken into account in unwinding, for example, by loading and/or relieving the reel by means of a set of belts so that the loading and/or the relief profile correspond(s) to that/those used in the reeling up.

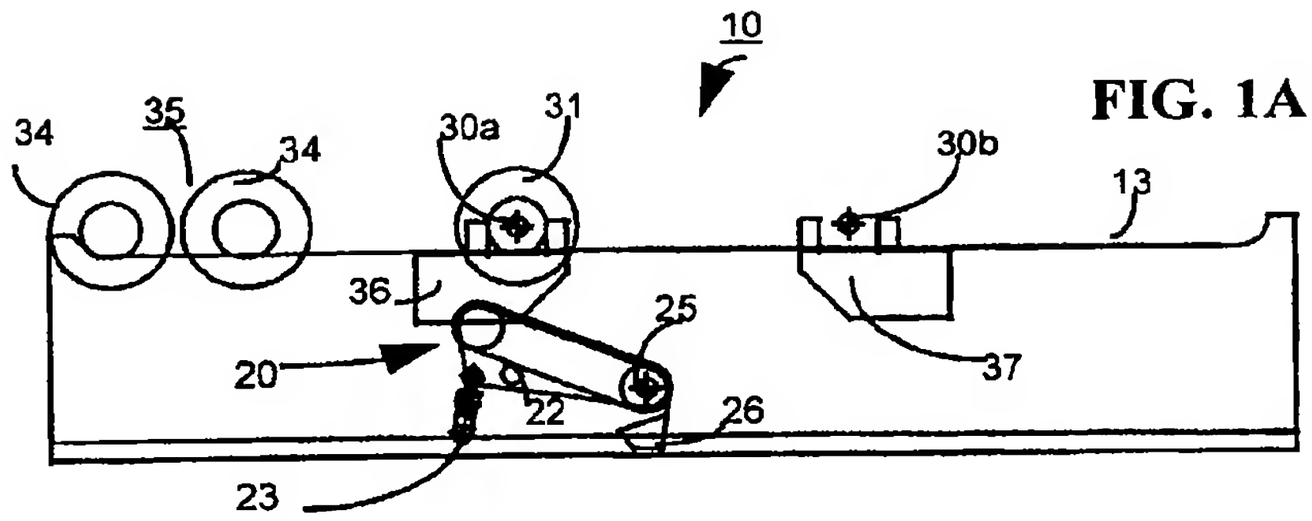

FIG. 1A

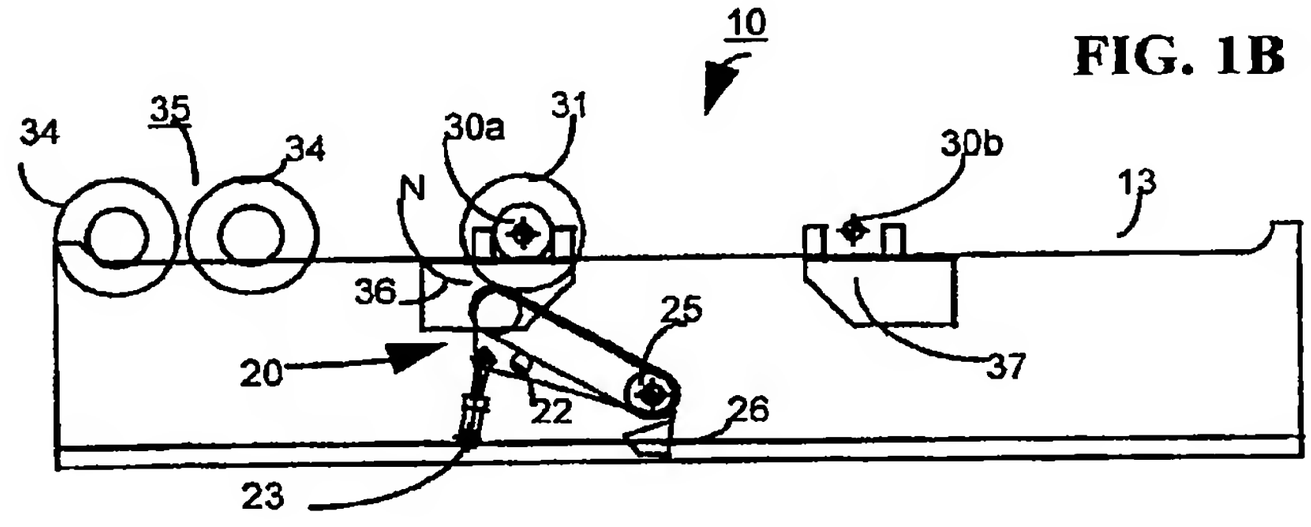

FIG. 1B

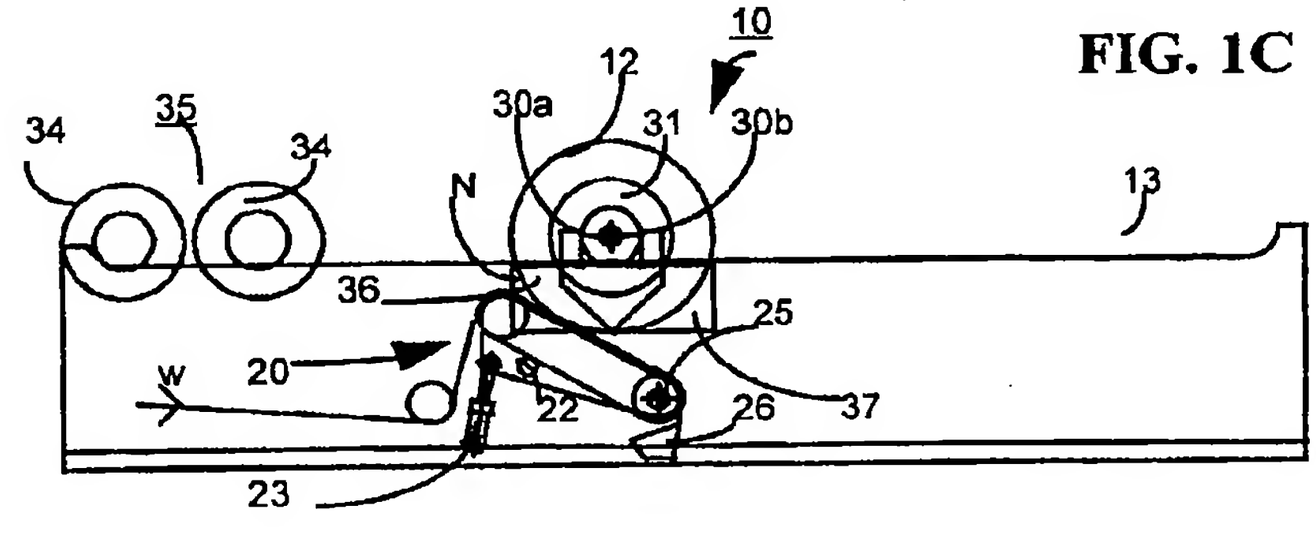

FIG. 1C

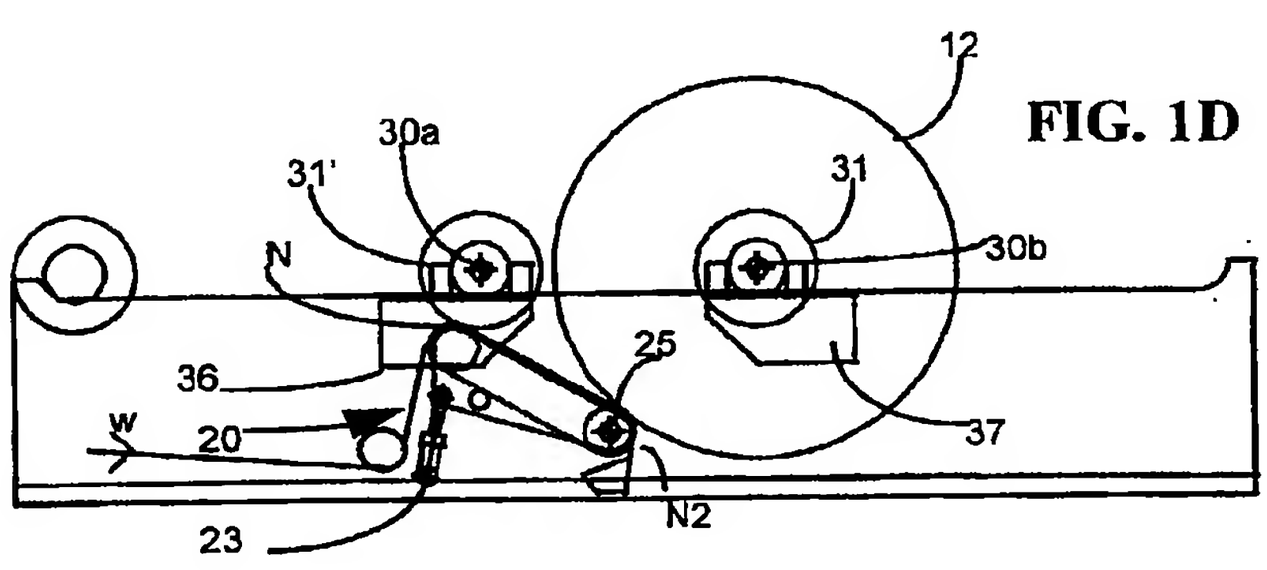

FIG. 1D

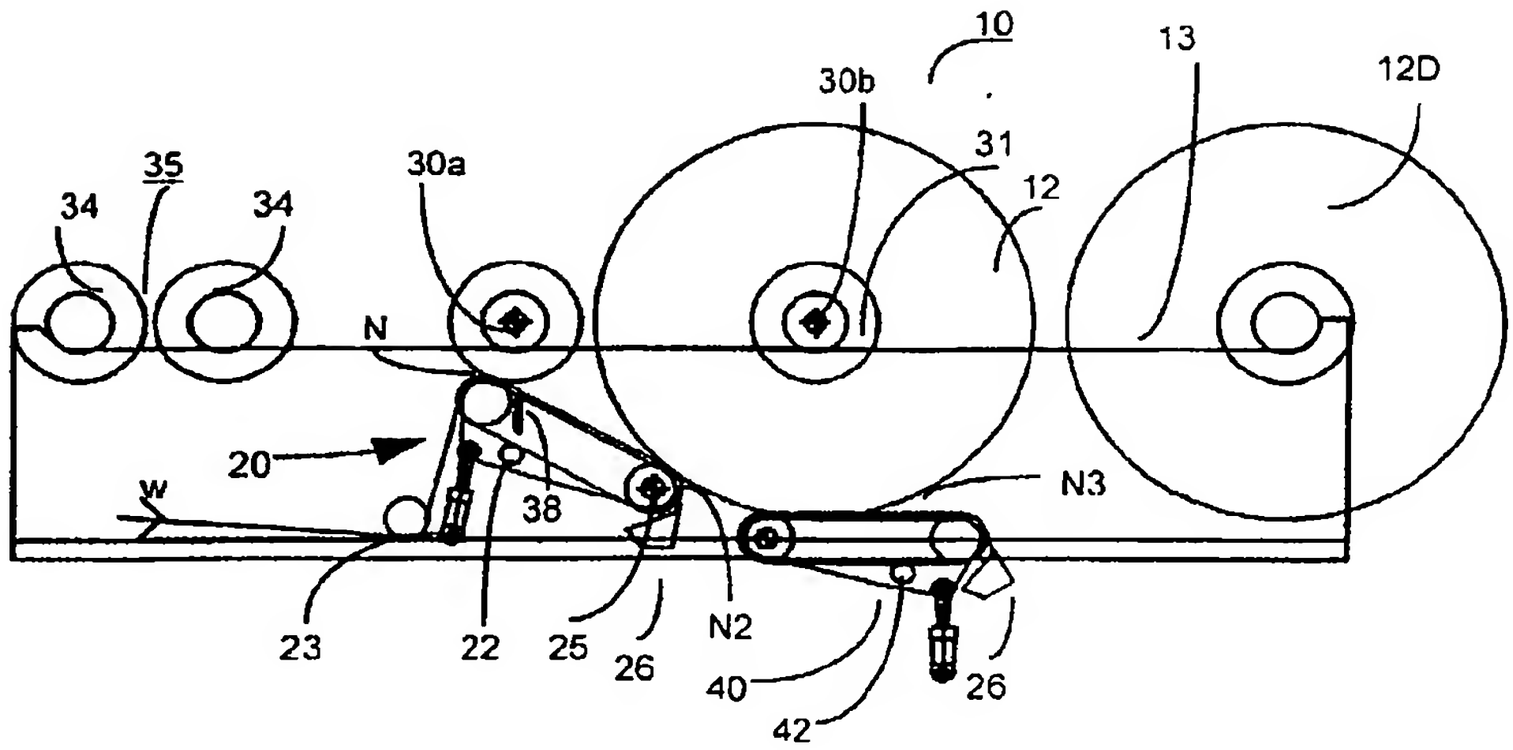

FIG. 2

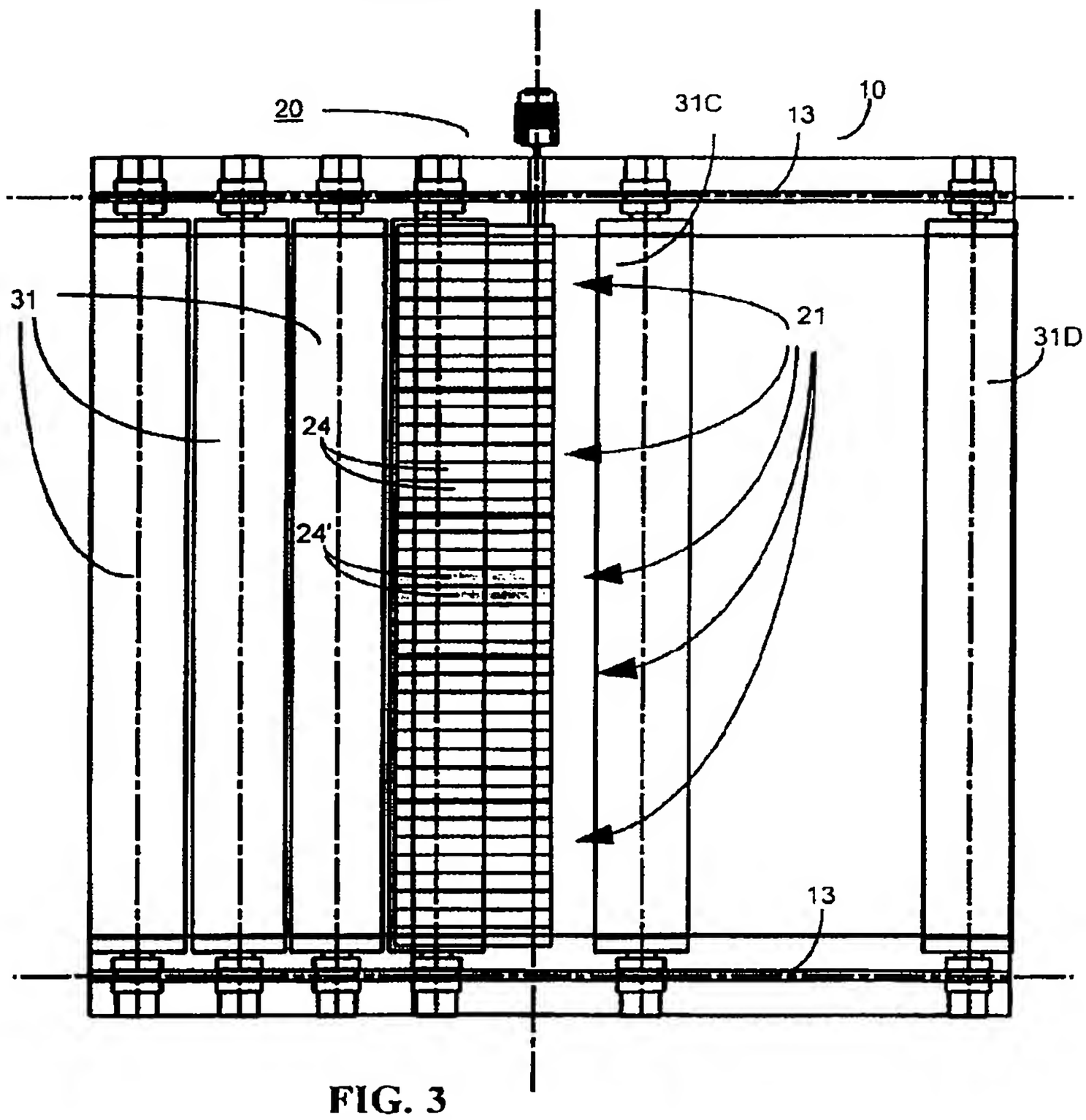

FIG. 3

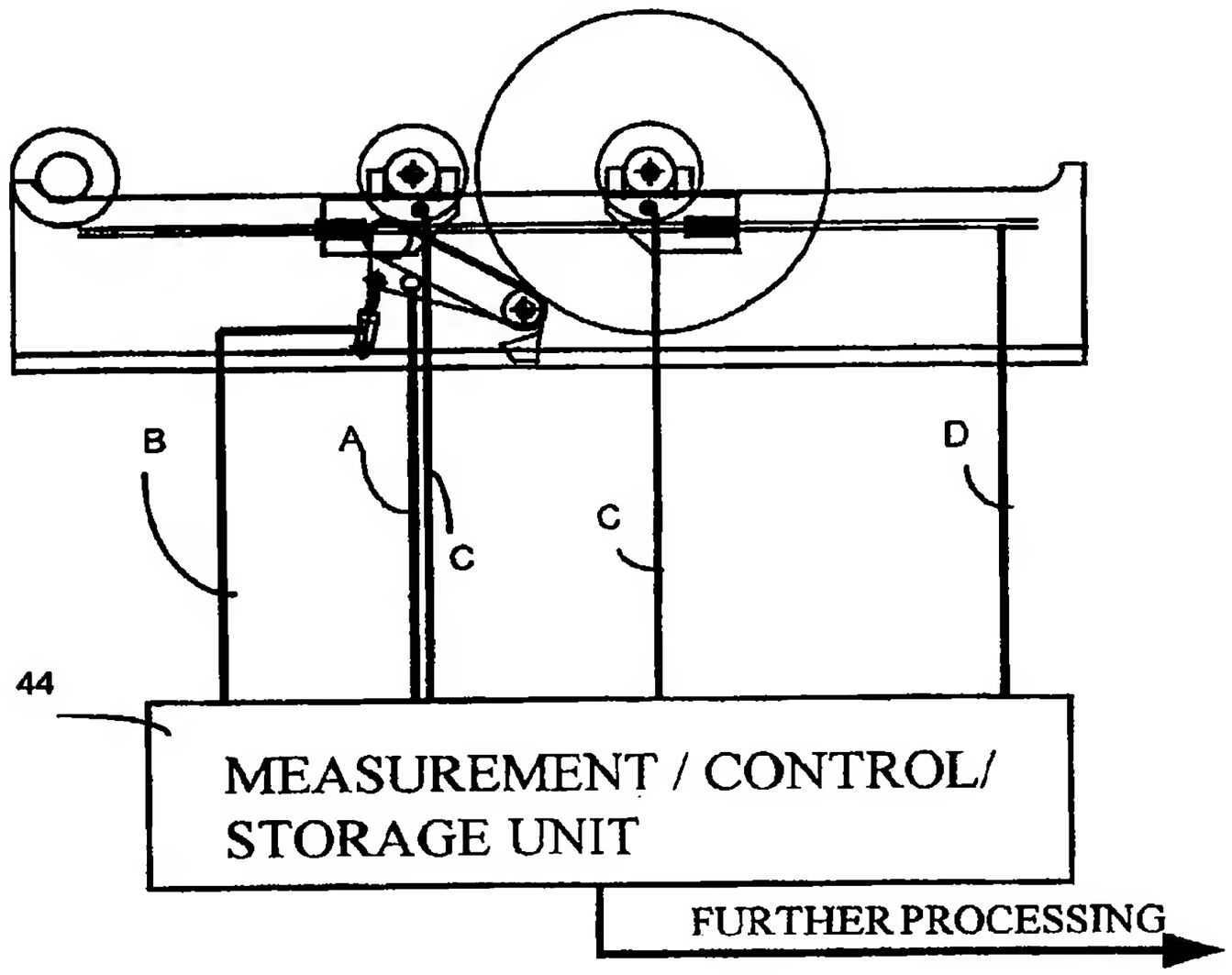

FIG. 4

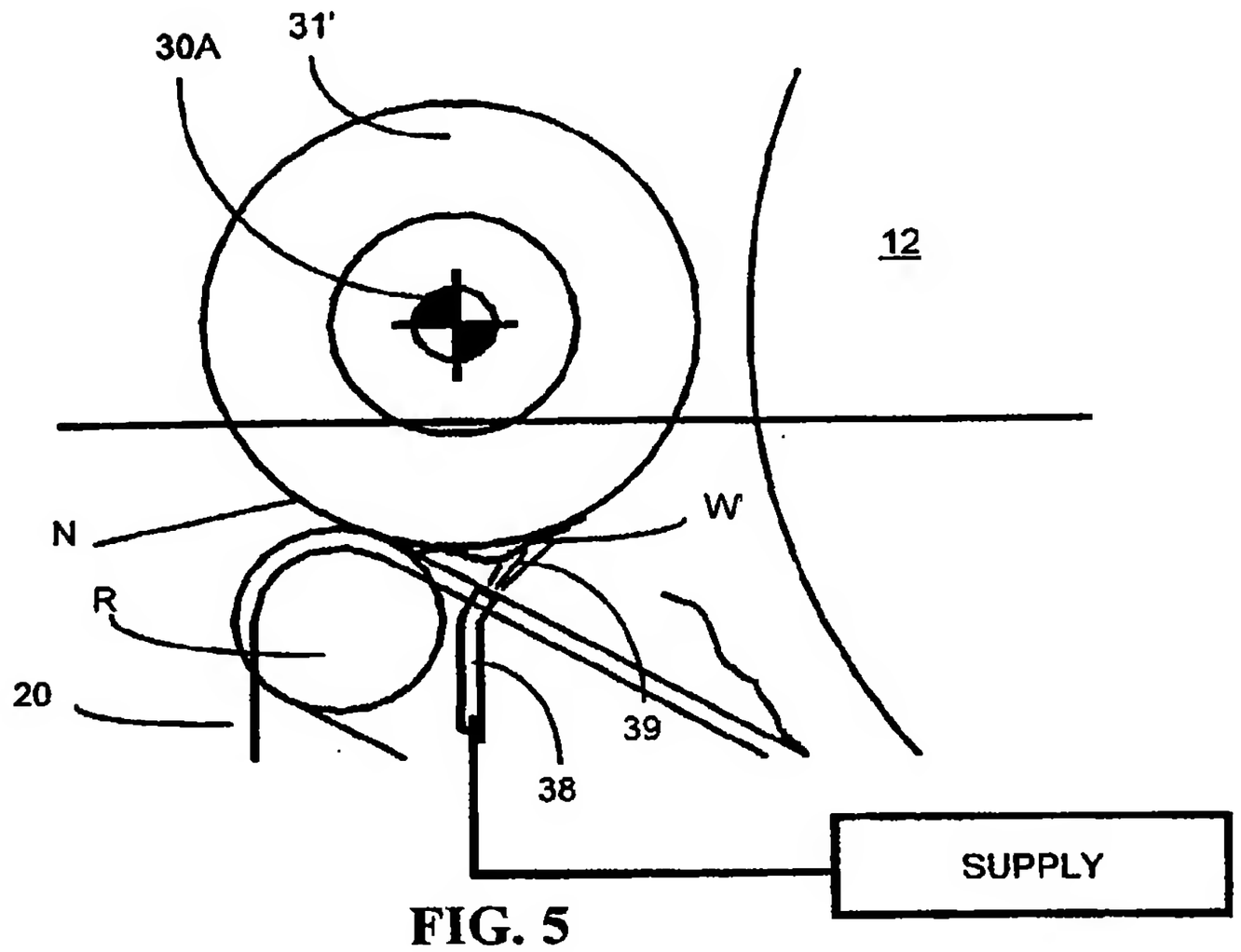

FIG. 5

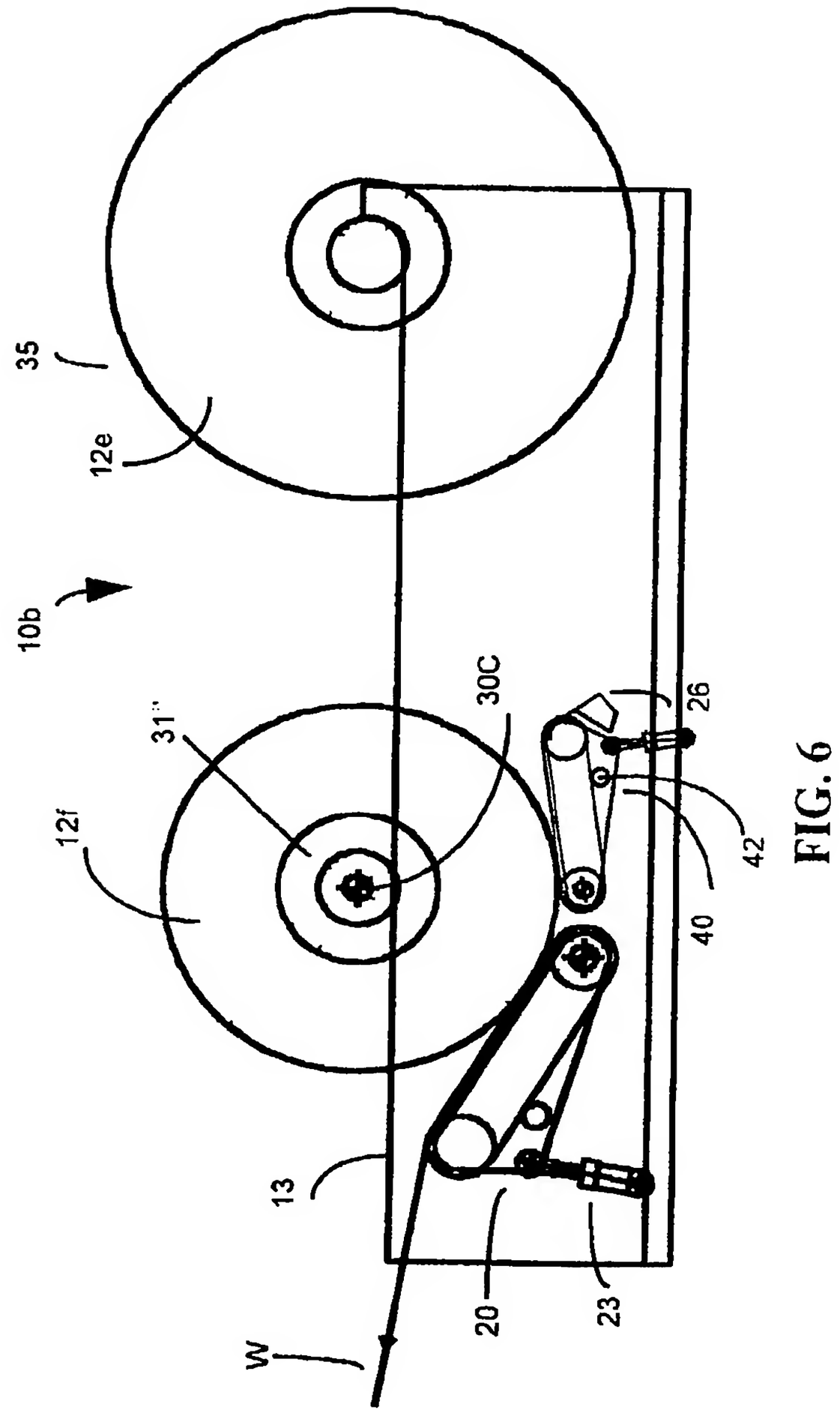

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 98660004.7

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
X	US 4283023 A (BRAUN et al.) 11 August 1981 (11.08.81), the whole document. --	1,13	B 65 H 18/26 B 65 H 18/10 B 65 H 18/22
A	US 5393008 A (KYYTSÖNEN et al.) 28 February 1995 (28.02.95), the whole document. --	1-19	
A	US 4830304 A (FUKE et al.) 16 May 1989 (16.05.89), the whole document. --	1-19	
A	US 5150850 A (ADAMS) 29 September 1992 (29.09.92), the whole document. ----	1-19	
			TECHNICAL FIELDS SEARCHED (Int. Cl.6) B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	24-04-1998	LOSENICKY

EPO FORM 1503 03.82 (P0401)

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